REMARKS

The Second Final Office Action mailed December 4, 2007, has been received and carefully reviewed. As of the December 4, 2007 Office Action, Claims 1-29, 31-34 and 48-53 were pending and presently stand rejected. Applicant herein amends Claim 1.

As of this AMENDMENT C, Claims 1-29, 31-34 and 48-53 are believed to be in condition for allowance and Applicant respectfully requests reconsideration of the application as amended herein.

Drawings Objection

The Examiner has objected to the drawings under 37 C.F.R. § 1.83(a). More specifically, the Examiner notes that there is no drawing of a CIE Chromaticity diagram which shows the McAdam ellipses which are being claimed. The Examiner further notes that there is no drawing of a CIE Chromaticity diagram in which the Planckian Locus is shown with the McAdam ellipses on or adjacent to the Planckian Locus within a predefined correlated color temperature range.

Applicant submits herewith New Drawing Sheet 13. New Drawing Sheet 13 illustrates FIG. 13, which is a graphical representation of a 1931 CIE Chromaticity Diagram illustrating exemplary McAdam Ellipses on or adjacent to the Planckian Locus as requested by the Examiner. No new matter has been added. Applicant also submits herewith Replacement Sheets 1-12 to renumber for the addition of New Drawing Sheet 13. Applicant respectfully requests reconsideration of the drawings objection.

35 U.S.C. § 103(a) Obviousness Rejections

The Supreme Court in *KSR International Co. v. Teleflex Inc.*, reaffirmed the objective analysis for determining obviousness under 35 U.S.C. § 103: "[T]he scope and content of the prior art are . . . determined; differences between the prior art and the claims at issue are . . . ascertained; and the level of ordinary skill in the pertinent art resolved." 127 S.Ct. 1727, 1729-30, (U.S. 2007) (quoting *Graham v. John Deere Co.*, 383 U.S. 1, 17-18 (1966)).

M.P.E.P. 706.02(j) sets forth the contents of a Section 103(a) rejection:

> To support the conclusion that the claimed invention is directed to obvious subject matter, either the references must expressly or impliedly suggest the claimed invention or the examiner must present a convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the references. *Ex parte Clap*, 227 U.S.P.Q. 972, 973 (Bd. Pat. App. & Inter. 1985).

Obviousness Rejection Based on U.S. Patent No. 6,441,558 to Muthu et al. in view of U.S. Patent No. 5,803,579 to Turnbull et al. and U.S. Patent No. 6,379,022 to Amerson et al.

The Examiner has rejected Claims 1-2 and 20-23 under 35 U.S.C. § 103(a) as being unpatentable over Muthu et al. in view of Turnbull et al. and Amerson et al. Applicant has amended Claim 1 to eliminate the ambiguity noted by the Examiner. Amended Claim 1 now recites:

> 1. (Currently Amended) An LED array formed of a plurality of LEDs, each uniquely colored LED or group of identically colored LEDs comprising a dominant wavelength within the visible spectrum (400 to 750 nm), the plurality of LEDs comprising at least five distinct narrowband colors, wherein relative luminance values for all LEDs within the LED array operating at full brightness levels results in a composite white-type light that, when plotted on a CIE Chromaticity diagram, falls within a McAdam ellipse that is on or adjacent to a Planckian Locus within a predefined correlated color temperature (CCT) range.

With regard to Claim 1, the Examiner asserts that Muthu et al. teach an LED array formed of a plurality of LEDs (FIG. 1, reference numbers 22, 24 and 28). Applicant acknowledges same and notes that the Muthu et al. LEDs are red 22, green 22 and blue 28, only. Col. 2:61-63. More specifically, Muthu et al. teach "a white luminary LED [that] is made of three types of LED light sources, using a plurality of Red, Green and Blue LEDs." Col. 1:61-63. The invention of Muthu et al. "relates to LED Luminaries and more specifically, to a control system for providing white light with selectable color temperature

and dimming level." Col. 1:5-8. Muthu et al. do not disclose or suggest using LEDs with colors other than red, green and blue (RGB), because Muthu et al. further discloses a "light control system [that] is configured to maintain the color temperature and the lumen output level of the emitted white light." Col. 1:63-65. In summary, Muthu et al. do not teach or suggest using "at least five distinct narrowband colors", as recited in Claim 1 because the white light source Muthu et al. is attempting to simulate may be achieved by suitable control of RGB only.

The Examiner acknowledges that Muthu et al. do not teach the visible spectrum (400 to 750 nm). The Examiner further asserts that Turnbull et al. teaches the visible spectrum of light is from 380nm to 780nm. Col. 6:22-25. Applicant acknowledges same. More importantly, in discussing the additive color mixing of RGB displays Turnbull et al. further teaches:

> Energizing all three of the red, green, and blue sub-pixels within a pixel concurrently will yield the perceived color white, if the brightness of each sub-pixel is proportioned properly. The relative proportions of the brightness of each of these differently colored sub-pixels can further be actively manipulated in a wide variety of combinations resulting in a continuum of perceived colors nearly replicating all of the colors available within human color vision, including white. Col. 6:45-53.

Turnbull et al. further teaches:

> LEDs are available in various hues and it is known that the output of red, blue and green LEDs can be combined in a fashion similar to that used for a CRT in the proper proportions to produce a variety of perceived colors, including the perceived color white. For example, in U.S. Pat. No. 5,136,483, Karl-Heinz Schoniger et al. disclose a light emitting device having twelve LEDs arranged to form a headlamp or signaling lamp. Schoniger et al. also disclose that to produce white light, red, green and blue LEDs need to be used simultaneously. However, such as system is rather complicated and Schoniger et al. do not mention the inherent susceptibility of an R-G-B system to unacceptable variation due to significant variations in luminous output produced from one LED to another of the same type. Such LED variations causes errors in the relative proportions of the actual color mixture produced versus that desired and,

coupled with high complexity and cost, render the system undesirable for most practical uses. Col. 7:1-18.

The invention of Turnbull et al. is an LED array having only two complementary colors, e.g., "blue-green and amber," that when mixed "form a metameric white illumination." Col. 7:66 to Col. 8:7. The invention of Turnbull et al. attempts to solve the problem of providing "a highly reliable, low-voltage, long-lived, LED illuminator capable of producing white light with sufficient luminous intensity to illuminate subjects of interest." Col. 7:19-24. Turnbull et al. specifically distinguishes its binary-complementary LED approach to white light generation over RGB systems such as Muthu et al. because of the added complexity. Col. 19:55 to Col. 20:20. "In addition, process controls, inventory management, materials handling, and electronic circuit design are further simplified by only having two colors to manipulate rather than three. This substantial simplification decreases manufacturing costs significantly." Col. 22:28-35.

In summary, Turnbull teaches away from using 5 or more narrowband colored LEDs as recited in Claim 1 because of the increased complexity. Neither Muthu et al. nor Turnbull et al. teach or suggest using more than at most three unique narrowband colors of LEDs for any application.

However, the Examiner further asserts that Amerson et al. teaches an LED array of four distinct colors for the purpose of generating white light. Col. 2:66-67. More specifically, Amerson et al. teaches an array of LEDs containing red, green, blue and amber LEDs. *Id*. The Examiner further asserts "that using an array of four colors creates white light. Adding a fifth color to this array will simulate white light closer to sunlight. It has been a goal of the art to produce white light as similar to the white light emitted by the sun. Likewise, increasing the amount of distinctly colored narrowband colors in the array will simulate a white light that is even closer to the white light emitted by the sun." Office Action, p. 4, second full ¶.

The Examiner has asserted these three facts under "official notice" without any documentary evidence for support. Applicant would like to remind the Examiner that official notice without documentary evidence to support an examiner's conclusion is

permissible only in some circumstances. While "official notice" may be relied on, these circumstances should be rare when an application is under final rejection. MPEP § 2144.03. Official notice unsupported by documentary evidence should only be taken by the Examiner where the facts asserted to be well-known, or to be common knowledge in the art are capable of instant and unquestionable demonstration as being well-known. *In re Ahlert*, 424 F.2d 1088, 1091 (C.C.P.A. 1970). It would not be appropriate for the Examiner to take official notice of facts without citing a prior art reference where the facts asserted to be well known are not capable of instant and unquestionable demonstration. *Id*. For example, assertions of technical facts in the areas of esoteric technology or specific knowledge of the prior art must always be supported by citation to some reference work recognized as standard in the pertinent art. *In re Ahlert*, 424 F.2d at 1091; see also *In re Grose*, 592 F.2d 1161, 1167-68 (C.C.P.A. 1979). It is never appropriate to rely solely on "common knowledge" in the art without evidentiary support in the record, as the principal evidence upon which a rejection was based. *In re Zurko*, 258 F.3d 1379, 1385 (Fed. Cir. 2001) ("[T]he Board cannot simply reach conclusions based on its own understanding or experience—or on its assessment of what would be basic knowledge or common sense. Rather, the Board must point to some concrete evidence in the record in support of these findings.").

To produce white light, the cited references teach that a combination of colors must have their relative intensity levels balanced against one another. Muthu et al. and Turnbull et al. describe balancing the relative intensities of red, green and blue LEDs to obtain a "white" light. While the Examiner has not relied on Turnbull for any teaching other than (the spectrum of visible light), the Applicant notes that Turnbull also describes balancing the relative intensities of red, green and blue to achieve white light. Amerson et al. describes balancing the relative intensities of red, green, blue and amber LEDs to obtain a "white" light. Even were a person of skill in the art to add a fifth color LED to the four-color system of Amerson, the clear teaching of the prior art is that the relative intensities of the five colors of the resulting system must be adjusted to achieve white light. That is, the cited references clearly teach that operating three or more LEDs of different colors at full intensity will not produce white light, much less produce "a composite white-

type light that, when plotted on a CIE Chromaticity diagram, falls within a McAdam ellipse that is on or adjacent to a Planckian Locus within a predefined correlated color temperature (CCT) range," as recited in Claim 1.

For the same reason, the Examiner's assertion that "increasing the amount of distinctly colored narrowband colors in the array will simulate a white light that is even closer to the white light emitted by the sun," is also false, unless the proper discrete wavelength is selected relative to all other colors already included within the array and precise balancing of the intensities of all colors within the composite array is achieved. Moreover, the prior art of record neither teaches nor suggests a metric for measuring such "a composite white-type light". Applicant's amended Claim 1 recites a metric for measuring "a composite white-type light", namely, "relative luminance values for all LEDs within the LED array operating at full brightness levels results in a composite white-type light that, when plotted on a CIE Chromaticity diagram, falls within a McAdam ellipse that is on or adjacent to a Planckian Locus within a predefined correlated color temperature (CCT) range" This particular limitation is neither taught nor suggested in the art of record.

The Examiner acknowledges that Muthu et al., Turnbull et al. and Amerson et al. do not explicitly teach "relative luminance values for all LEDs within the LED array operating at full brightness levels results in a composite white-type light that, when plotted on a CIE Chromaticity diagram, falls within a McAdam ellipse that is on or adjacent to a Planckian Locus within a predefined correlated color temperature (CCT) range", as recited in Claim 1. The Applicant agrees. However, the Examiner further asserts that "one of ordinary skill in the art would know that any light source (including LEDs) is capable of being plotted on a CIE Chromaticity diagram within McAdams ellipse that are on or adjacent to a Planckian Locus within a predefined correlated color temperature range". This assertion by the Examiner is factually incorrect.

As stated in the Specification, the CIE chromaticity diagram, McAdam ellipses and the Planckian Locus are all concepts and terms well known to one of ordinary skill in the art. See Specification, paragraph [0045]. The CIE chromaticity diagram maps all colors perceivable by humans, plotted with the CIE parameters x and y. The Planckian Locus is

the path (or locus) of points on the CIE diagram that map the color of a blackbody radiator as the blackbody temperature changes. As the temperature of a blackbody radiator increases, its color passes along the Planckian Locus from an orange color, to a 'warm' orange-tinted white, through a 'pure' white, and to a 'cool' blue-tinted white. A particular color of white is characterized by its correlated color temperature, which is the temperature of a blackbody radiator that most closely matches the particular color of white being characterized. A McAdam ellipse is a region on the CIE diagram in which colors are indistinguishable from each other to the human eye.

Thus, the claim language "on or adjacent to a Planckian Locus within a predefined correlated color temperature range," is understood to mean a color that is the same as or near to a 'shade' of white produced by a blackbody radiator of a predefined temperature. The claim language "falls within a McAdam ellipse that are on or adjacent to a Planckinan Locus within a predefined correlated color temperature range," is understood to describe regions wherein colors are indistinguishable from the 'shade' of white produced by the blackbody radiator of the predefined temperature. The claim language "a composite white-type light that, when plotted on a CIE Chromaticity diagram, falls within a McAdam ellipse that are on or adjacent to a Planckian Locus within a predefined correlated color temperature (CCT) range," is understood to mean a white color whose CIE x and y parameters fall within one of the regions wherein colors are indistinguishable from the 'shade' of white produced by the blackbody radiator of the predefined temperature.

Returning to the Examiner's assertion that "one of ordinary skill in the art would know that any light source (including LEDs) is capable of being plotted on a CIE Chromaticity diagram within McAdams ellipses that are on or adjacent to a Planckian Locus within a predefined correlated color temperature range," the Applicant agrees with the Examiner that any (visible) light source, including LEDs, is capable of being plotted on a CIE chromaticity diagram. However, from the above discussion it is clear that a person of skill in the art would understand that most light sources are not, in fact, capable of being plotted on a CIE Chromaticity diagram within McAdams ellipses that are on or adjacent to a Planckian Locus within a predefined correlated color temperature range.

The Examiner states that the inclusion of additional colors beyond four in an LED array represents nothing more than "a mere duplication of essential working parts of a device" and one that would involve "only routine skill in the art." The cited references describe balancing the relative intensities of three- or four-color light sources to achieve white light of an unspecified correlated color temperature. Amended Claim 1 recites a light source whose at least five colors, when operated at full brightness, produce not merely 'white', but white light of a predefined correlated color temperature. As such, the claimed invention recites more than a mere duplication of essential working parts of a prior art device, involving only routine skill in the art.

Claims 2 and 20-23 depend from amended Claim 1. In view of the amendment to Claim 1, Applicant respectfully requests reconsideration of the Examiner's obviousness rejection of Claims 1-2 and 20-23 based on the asserted combination of Muthu et al. in view of Turnbull et al. and Amerson et al.

Obviousness Rejection Based on U.S. Patent No. 6,441,558 to Muthu et al. in view of U.S. Patent No. 5,803,579 to Turnbull et al. and U.S. Patent No. 6,379,022 to Amerson et al. as applied to Claim 1 and further in view of LEDTRONICS, Inc. (100-02a.htm)

The Examiner has rejected Claims 3-5 under 35 U.S.C. § 103(a) as being unpatentable over Muthu et al. and Turnbull et al. in view of LEDTRONICS, Inc. (100-02a.htm). The Examiner acknowledges that neither Muthu et al. nor Turnbull et al. nor Amerson et al. teaches LEDs producing colored light with a spectral half-width of less than about 60 nm, 40 nm, or 30 nm. The Examiner asserts that LEDTRONICS, Inc. (100-02a.htm) teaches LEDs having spectral half-widths ranging from 90 nm down to 20 nm. The Examiner further asserts that "it would have been obvious at the time the invention was made to use the LEDs of LEDTRONICS for the array of LEDs of Muthu et al. within the visible spectrum as noted by Turnbull et al. since the LEDs of LEDTRONICS provide a greater range of spectral emissions in order to achieve white light." Office Action p. 6, second full ¶.

Applicant notes that the Examiner's suggested motivation—to "provide a greater range of spectral emissions"—is contrary to the language of Claims 3-5. Progressively

narrower spectral half-widths, by definition, provide progressively ***smaller*** ranges of spectral emissions, rather than greater ranges.

As such, Applicant seeks clarification of how the recited spectral half-widths recited in Claims 3-5 "provide a greater range of spectral emissions in order to achieve white light" as asserted by the Examiner? The spectral half widths specified in Claims 3-5 narrow the spectral emissions relative to the unlimited Claim 1. Thus, it seems readily apparent that Claims 3-5 DO NOT "provide a ***greater*** range of spectral emissions in order to achieve white light" as suggested by the Examiner. Rather, they provide ***narrower*** ranges of spectral emissions. Claims 3-5 ***further restrict*** the invention within Claim 1; they do not broaden it.

Claims 3-5 depend from amended Claim 1. Applicant asserts that none of the references of record appear to teach or suggest the limitations of amended Claim 1:

> 1. (Currently Amended) An LED array formed of a plurality of LEDs, each uniquely colored LED or group of identically colored LEDs comprising a dominant wavelength within the visible spectrum (400 to 750 nm), the plurality of LEDs comprising at least five distinct narrowband colors, wherein relative luminance values for all LEDs within the LED array operating at full brightness levels results in a composite white-type light that, when plotted on a CIE Chromaticity diagram, falls within a McAdam ellipse that is on or adjacent to a Planckian Locus within a predefined correlated color temperature (CCT) range.

For all of these reasons, Applicant respectfully requests reconsideration of the obviousness rejection of Claims 3-5.

Obviousness Rejection Based on U.S. Patent No. 6,441,558 to Muthu et al. in view of U.S. Patent No. 5,803,579 to Turnbull et al. and U.S. Patent No. 6,379,022 to Amerson et al. as applied to Claim 1 and further in view of LEDTRONICS, Inc. (38.htm)

The Examiner has rejected Claims 6-7, 9-10, 12-13 and 15-19 under 35 U.S.C. § 103(a) as being unpatentable over Muthu et al., Turnbull et al. Amerson et al. and further in view of LEDTRONICS, Inc. (38.htm). The Examiner acknowledges that neither Muthu et al. nor Turnbull et al. nor Amerson et al. teaches the limitations recited in Claims 6-7, 9-10, 12-13 and 15-19. The Examiner asserts that LEDTRONICS, Inc. (38.htm) teaches or suggests the additional limitations, which in combination with Muthu et al. and Turnbull et al. renders Claims 6-7, 9-10, 12-13 and 15-19 obvious.

Claims 6-7, 9-10, 12-13 and 15-19 depend from amended Claim 1. Applicant asserts that none of the references of record appear to teach or suggest the limitations of amended Claim 1:

> 1. (Currently Amended) An LED array formed of a plurality of LEDs, each uniquely colored LED or group of identically colored LEDs comprising a dominant wavelength within the visible spectrum (400 to 750 nm), the plurality of LEDs comprising at least five distinct narrowband colors, wherein relative luminance values for all LEDs within the LED array operating at full brightness levels results in a composite white-type light that, when plotted on a CIE Chromaticity diagram, falls within a McAdam ellipse that is on or adjacent to a Planckian Locus within a predefined correlated color temperature (CCT) range.

Regarding Claim 18, the Examiner asserts that LEDTRONICS, Inc. (38.htm) "teaches the dominant wavelengths gradually increasing away from either side of approximately 555nm." Office Action, p. 8, last partial ¶. The Examiner asserts that the series 555 nm, 560 nm, 564 nm and 569 nm "is gradually increasing in a positive direction." *Id.* The separations between 555 nm and the adjacent colors in the positive direction are 5 nm (560-555), 4 nm (564-560) and 5 nm (569-564). This progression of

separations does not increase gradually as recited in Claim 18. In fact, it goes down when measuring the separation between 560 nm and 564 nm. Similarly, the separation between adjacent colors in the negative direction away from 555 nm (528 nm, 502 nm and 460 nm) is not gradually increasing. The separations between adjacent dominant wavelengths in the negative direction measured from 555 nm in the LEDTRONICS, Inc. (38.htm) reference are: 27nm, 26 nm and 42 nm. Again, the progression of separations (in the negative direction) between adjacent dominant wavelengths DOES NOT gradually increase. In view of this analysis, Applicant asserts that Claim 18 is independently non-obvious over the asserted combination of Muthu et al., Turnbull et al. Amerson et al. and further in view of LEDTRONICS, Inc. (38.htm).

For all of the above reasons, Applicant respectfully requests reconsideration of the obviousness rejection of Claims 6-7, 9-10, 12-13 and 15-19.

Obviousness Rejection Based on U.S. Patent No. 6,441,558 to Muthu et al. and U.S. Patent No. 5,803,579 to Turnbull et al. and U.S. Patent No. 6,379,022 to Amerson et al. and LEDTRONICS, Inc. (38.htm) as applied to Claim 1 and further in view of The LED Museum (ledleft.htm)

The Examiner has rejected Claims 8, 11 and 14 under 35 U.S.C. § 103(a) as being unpatentable over Muthu et al. and Turnbull et al. and Amerson et al. and LEDTRONICS, Inc. (38.htm) and further in view of The LED Museum (ledleft.htm). The Examiner acknowledges that neither Muthu et al. nor Turnbull et al. and LEDTRONICS, Inc. (38.htm) teach the limitations recited in Claims 8, 11 and 14. The Examiner asserts that The LED Museum (ledleft.htm) teaches or suggests the additional limitations, which in combination with Muthu et al. and Turnbull et al. and Amerson et al. and LEDTRONICS, Inc. (38.htm) renders Claims 8, 11 and 14 obvious.

Claims 8, 11 and 14 depend from amended Claim 1. Applicant's review of the Examiner's asserted combination of Muthu et al. and Turnbull et al. and Amerson et al. and LEDTRONICS, Inc. (38.htm) and further in view of The LED Museum (ledleft.htm) does not appear to teach or suggest all of the limitations of amended Claim 1. More specifically, it is not apparent to the Applicant that the references teach or suggest

"relative luminance values for all LEDs within the LED array operating at full brightness levels results in a composite white-type light that, when plotted on a CIE Chromaticity diagram, falls within a McAdam ellipse that is on or adjacent to a Planckian Locus within a predefined correlated color temperature (CCT) range" as recited in amended Claim 1. For this reason, Applicant respectfully requests reconsideration of the obviousness rejection of Claims 8, 11 and 14.

Obviousness Rejection Based on U.S. Patent No. 6,441,558 to Muthu et al. and U.S. Patent No. 5,803,579 to Turnbull et al. and U.S. Patent No. 6,379,022 to Amerson et al. as applied to Claim 1

The Examiner has rejected Claims 24-26 under 35 U.S.C. § 103(a) as being unpatentable over Muthu et al., Turnbull et al. and Amerson et al. The Examiner acknowledges that neither Muthu et al. nor Turnbull et al. nor Amerson et al. teach the amount of power that each of the plurality of LEDs comprise. The Examiner asserts that it "would have been obvious to one skilled in the art at the time the invention was made to perform testing to acquire the optimal Wattage values because this would ensure that the LEDs would not overheat." Office Action, p. 11, last full ¶.

The Examiner's rationale for specifying a particular wattage would suggest that Applicant cannot use some particular wattage (presumably high) because overheating might occur. Applicant asserts that one of ordinary skill in the art knows that overheating is a problem solved by the use of appropriate fans and heat sinks. Overheating is simply not a reasonable rationale behind the selection of a particular wattage value for an LED. Applicant is claiming "each of the plurality of LEDs" having specified amounts of power regardless of "overheating". Applicant is not claiming an "optimal Wattage value" but rather specifying minimum wattage values.

Claims 24-26 depend from amended Claim 1. Applicant asserts that none of the references of record appears to teach or suggest "relative luminance values for all LEDs within the LED array operating at full brightness levels results in a composite white-type light that, when plotted on a CIE Chromaticity diagram, falls within a McAdam ellipse that is on or adjacent to a Planckian Locus within a predefined correlated color

temperature (CCT) range" as recited in amended Claim 1. For this reason, Applicant respectfully requests reconsideration of the obviousness rejection of Claims 24-26.

Obviousness Rejection Based on U.S. Patent No. 6,441,558 to Muthu et al. and U.S. Patent No. 5,803,579 to Turnbull et al. and U.S. Patent No. 6,379,022 to Amerson et al. as applied to Claim 1

The Examiner has rejected Claims 27-29 under 35 U.S.C. § 103(a) as being unpatentable over Muthu et al., Turnbull et al. and Amerson et al. The Examiner asserts that "one of ordinary skill in the art would recognize that any five or more distinct narrowband colors of LEDs can be plotted and an area enclosed by plotting an output of each LED on a CIE Chromaticity diagram as a point and connecting the points can be generated covering at least 75%, 85% and/or 95% of a total area defined within a curve of spectrally pure colors and an alychne of purple colors." Office Action, p. 12, second full ¶.

This assertion by the Examiner is factually incorrect. It is NOT true that "any" five or more colors can be plotted in such a way. Only five or more colors that have been very carefully selected as a collective mix, *i.e.*, five or more colors that meet the limitations of amended Claim 1, and specifically spaced apart from one another, can be plotted in such a way.

Applicant asserts that there are many conceivable combinations of five or more colors that can not cover a minimum of 75% of the CIE diagram. For example, an array comprised of violet, indigo, blue, cyan, and green would only be capable of covering a small area in the left portion of the CIE diagram, which comprises only green-type through violet/blue-type light.

In addition to being very carefully spaced apart from one another across the visible spectrum, in order to meet the limitations of Claims 27-29, the individual colors within the array would also have to be sufficiently narrowband or saturated (*i.e.*, spectrally pure, having a narrow spectral power distribution) to be plotted near the perimeter of the CIE Chromaticity diagram. Any emitters that are not sufficiently narrowband would be plotted nearer the center of the CIE diagram within the pastel-type

colors surrounding the white region. Combinations of emitters of this relatively broader-band or unsaturated type would only be capable of covering a small area within the CIE diagram, not the 75% or greater coverage recited in Claims 27-29.

Since Claims 27-29 add further limitations to Claim 1, not only would the five or more narrowband colors have to be carefully spaced apart from one another in order to cover the specified area within the CIE diagram, they would also have to meet the further limitations of Claim 1 and be balanced in their relative brightness such that they produce a white-type composite light ***when all emitters are operating at full intensity*** within the array. This further narrows the scope of the claimed invention and further distinguishes the invention from anything found in the prior art referenced by the Examiner.

Applicant has enclosed a graphic (Exhibit 1) illustrating an example of a five discrete LED array that satisfies the limitations of amended Claim 1, and yet which does not satisfy all of the limitations of Claim 27. Exhibit 1 illustrates a drawing of five narrowband colors (super blue 470 nm, super pure green 560 nm, super lime yellow 574 nm, super yellow 595nm and super orange 612 nm) plotted as points on the CIE chromaticity diagram. The five points define a roughly triangular area of coverage on the CIE chromaticity diagram. The relative luminance values for all five LEDs within the LED array operating at full brightness levels results in a composite white-type light that, when plotted on a CIE chromaticity diagram, falls within a McAdam ellipse that is on or adjacent to a Planckian Locus within a predefined correlated color temperature (CCT) range. Note that the roughly triangular area defined by the five connected points does not cover at least 75% of the total area (triangular area + white background) defined within the curve of spectrally pure colors and the alychne of purple colors.

As another example, Applicant has enclosed a graphic (Exhibit 2) as an example of an LED array that satisfies both the limitations of amended Claim 1 and Claim 27. Exhibit 2 illustrates five discrete colors (super blue 470nm, blue green 505 nm, aqua green 525 nm, super pure green 560 nm and ultra red 660 nm) plotted as points on the CIE Chromaticity diagram. The five points have been connected to form an irregular pentagon defining an area of coverage on the CIE chromaticity diagram. The relative luminance values for all 5 of these LEDs operating at full brightness levels results in a

composite white-type light that, when plotted on the CIE Chromaticity diagram, falls within a McAdams ellipse that is on or adjacent to a Planckian Locus within a predetermined correlated color temperature (CCT) range. The area enclosed by the irregular pentagon is at least 75% of the total area (irregular pentagon + white background area).

In view of these arguments and examples, Applicant argues that it would not be obvious for one of ordinary skill in the art to specify an area of coverage on the CIE chromaticity diagram. Applicant respectfully requests reconsideration of the obviousness rejection of Claims 27-29 in view of Muthu et al., Turnbull et al. and Amerson et al.

Obviousness Rejection Based on U.S. Patent No. 6,441,558 to Muthu et al. in view of U.S. Patent No. 5,803,579 to Turnbull et al. and U.S. Patent No. 6,379,022 to Amerson et al. as applied to Claim 1 and further in view of LEDTRONICS, Inc. (097b.htm)

The Examiner has rejected Claims 31-34 under 35 U.S.C. § 103(a) as being unpatentable over Muthu et al., Turnbull et al. and Amerson et al. and further in view of LEDTRONICS, Inc. (097b.htm). The Examiner acknowledges that neither Muthu et al. nor Turnbull et al. teaches the "relative luminance values for all LEDs within the LED array operating at full brightness levels results in a composite white-type light that, when plotted on a CIE Chromaticity diagram, falls within a McAdam ellipse that is on or adjacent to a Planckian Locus within a predefined correlated color temperature (CCT) range", as recited in amended Claim 1.

The Examiner asserts that LEDTRONICS, Inc. (097b.htm) teaches or suggests the CIE Chromaticity diagrams from 1931 and 1976 which show the relative luminance values of all LEDs operating at full brightness levels plotted on a CIE Chromaticity diagram and various temperature ranges as recited in Claims 31-34, which in combination with Muthu et al. and Turnbull et al. renders Claims 31-34 obvious.

As noted above, Muthu et al., Turnbull et al. and Amerson et al. fail to teach all of the limitations of amended Claim 1, particularly the limitation: "relative luminance values for all LEDs within the LED array *operating at full brightness levels* results in a composite white-type light that, when plotted on a CIE Chromaticity diagram, falls within a McAdam

ellipse that is on or adjacent to a Planckian Locus within a predefined correlated color temperature (CCT) range" as recited in amended Claim 1. LEDTRONICS, Inc. (097b.htm) does not appear remedy this lack of a teaching.

Claims 31-34 depend from amended Claim 1. For these reasons, Applicant respectfully requests reconsideration of the obviousness rejection of Claims 31-34.

Obviousness Rejection Based on U.S. Patent No. 6,441,558 to Muthu et al. in view of U.S. Patent No. 5,803,579 to Turnbull et al. and U.S. Patent No. 6,379,022 to Amerson et al. as applied to Claim 1 and further in view of Pearson Product Moment Correlation Coefficient

The Examiner has rejected Claims 48-53 under 35 U.S.C. § 103(a) as being unpatentable over Muthu et al., Turnbull et al. and Amerson et al. and further in view of Pearson Product Moment Correlation Coefficient. More specifically, the Examiner asserts the Muthu et al., Turnbull et al. and Amerson et al. teach all the limitations of Claims 48-53 except for using a specific correlation coefficient.

The Examiner has cited no motivation, suggestion or rationale that it would be obvious to recite a correlation coefficient between an LED array and midday sunlight. Applicant seeks clarification regarding the rationale for this assertion. Applicant is not aware of any reference or suggestion in the art of record that such specification of a particular correlation coefficient for an LED array meeting the limitations of Claim 1 would be within the knowledge of one of ordinary skill in the art.

Applicant is not merely claiming use of the correlation coefficient in the abstract. Applicant is claiming specific correlation coefficient values (at least .75, .80, .85, .90, or .95) as applied to the LED array recited in Claim 1. Applicant's review of the prior art references of record can find no disclosure or suggestion of producing an LED array that can match the output of midday sunlight with a high correlation coefficient.

To illustrate the claim language used in Claims 48-53, Applicant provides a couple of illustrative examples. Exhibit 3, enclosed herewith, is a graphic illustrating an LED array that satisfies the limitations of Claim 1, but does not satisfy the limitations of Claims 48-53. Exhibit 3 illustrates a drawing of an array comprised of five narrowband

colors of emitters (super blue 470nm, blue green 505 nm, aqua green 525 nm, super pure green 560 nm and ultra red 660 nm). The relative luminance values for all emitters within this particular array operating at full brightness levels results in a composite white-light that, when plotted on a CIE chromaticity diagram, falls within a McAdam ellipse that is on or adjacent to a Planckian Locus within a predefined CCT range. The composite light generated by this array has a correlation coefficient of 0.62 with midday sunlight.

Exhibit 4, enclosed herewith, is a graphic illustrating an LED array that satisfies the limitations of Claims 1, 48 and 49, but does not satisfy the limitations of Claims 50-53. Exhibit 4 illustrates a drawing of an array comprised of five narrowband colors of emitters (super blue 470 nm, blue green 505 nm, aqua green 525 nm, super pure green 560 nm and ultra red 660 nm). The relative luminance values for all emitters within this particular array operating at full brightness levels results in a composite white-light that, when plotted on a CIE chromaticity diagram, falls within a McAdam ellipse that is on or adjacent to a Planckian Locus within a predefined CCT range. The composite light generated by this array has a correlation coefficient of 0.77 with midday sunlight. It can be readily appreciated from these two examples that there are many combinations of five or more discrete LEDs that do not meet the limitations Claims 48-53.

Claims 48-53 depend from amended Claim 1. Thus, Claims 48-53 are believed to be allowable for the same reasons as amended Claim 1. For all these reasons, Applicant respectfully requests reconsideration of the obviousness rejection of Claims 48-53.

CONCLUSION

Claims 1-29, 31-34 and 48-53 are believed to be in condition for allowance, and an early notice thereof is respectfully solicited. Should the Examiner determine that additional issues remain which might be resolved by a telephone conference, the Examiner is respectfully invited to contact Applicants' undersigned attorney.

The Commissioner is hereby authorized to charge any additional fee or to credit any overpayment in connection with this Amendment to Deposit Account No. 50-0881.

Respectfully Submitted,

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Enclosures: Exhibits 1-4
Replacement Drawing Sheets 1-12
New Drawing Sheet 13